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State Health Access Data Assistance Center
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The Impact of Wireless-only Households on State Surveys of Health Insurance Coverage

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Introduction

Survey estimates of the distribution of health insurance coverage are critical for informing health policy. Many state and national household surveys that provide estimates of health insurance coverage rely on telephone data collection. However, telephone surveys have become more expensive and difficult to conduct, due in part to the increasing use of cell phones.

The increasing prevalence of cell phone coverage in the U.S., and the consequent increase in the number of people who use their cell phone in place of a landline, makes it difficult to reach target populations and may eventually threaten the quality of the data collected. This issue brief documents the survey research issues posed by the increase in wireless-only coverage in the U.S. and highlights the challenges posed by this environment and potential solutions.

Challenges from the Increasing Wireless-only Population

Wireless-only households are defined as households that do not have landline telephone service, having replaced the landline phone with their cell phone service. Traditional random digit dial (RDD) surveys are commonly used by states that conduct household surveys to estimate health insurance coverage. RDD is also the primary tool for the Behavioral Risk Factor Surveillance Study and the State and Local Area Integrated Telephone Survey, both conducted by the Centers for Disease Control and Prevention. These surveys do not typically sample phone numbers assigned to cell phones; as such the wireless-only population is excluded from these surveys.

These wireless-only households pose three main challenges for survey research:

1) Inefficiencies in dialing cell phone numbers and screening for eligible respondents.
2) Differences in the unit of measurement, in that cell phones are typically associated with a person whereas landline phones are typically associated with a household.
3) Problems defining the size of the wireless-only population for state and sub-state levels of geography.

Inefficiencies in reaching eligible wireless-only respondents are addressed primarily through screening and by dedicating substantial resources to the data collection effort (Keeter et al. 2008). Little research has addressed the unit of measurement issue, other than to collect a household roster of adults and their phone status to estimate probability of selection and attempt to ensure that just one member is interviewed for the survey. Defining the size of the wireless-only target population has been problematic for researchers because there has been just one national estimate of the wireless-only population. However, recent developments discussed later in this issue brief may provide reliable state-level estimates of the wireless-only population.

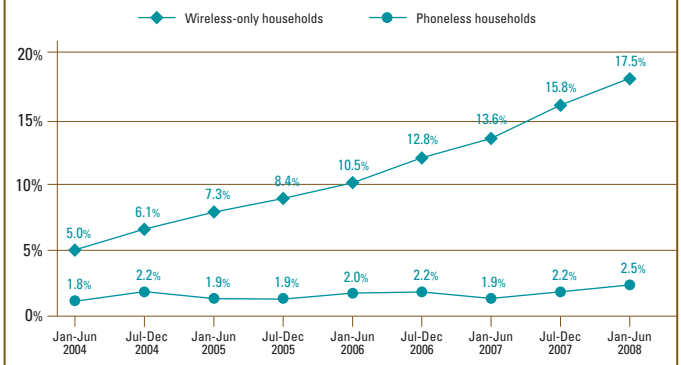
Another major issue for researchers is that the wireless-only household population differs from the landline on several demographic attributes. Compared to landline householders, the wireless only population tends to be younger, renters rather than homeowners, and non-White (Blumberg and Luke 2007, 2008b; Keeter et al. 2007; Link et al. 2007; Brick, Edwards, and Lee 2007). There are also differences on health-related attributes, discussed later in this brief. By excluding cell phone numbers from the sample, estimates of health insurance coverage are likely to be biased. This bias will likely increase as the number of people living in wireless-only households continues to grow.

Researchers need to understand the size and characteristics of the wireless-only population in order to assess the option to include a cell phone sample frame and, if not, understand the extent and direction of bias when excluding the wireless-only population for a health access survey. Accurate assessment of wireless-only coverage bias will help design post-stratification adjustments that may be able to reduce or eliminate coverage bias.

Wireless-only Prevalence

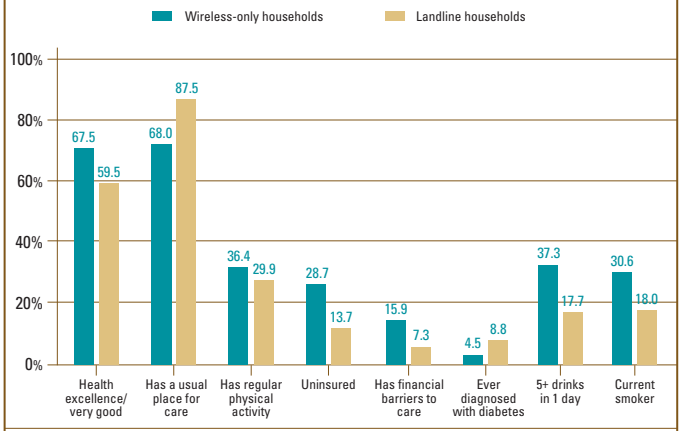
The latest findings from the National Health Interview Survey (NHIS) show that 17.5% of people lived in households that are wireless-only, and an additional 2.5% did not have any telephone service at all in the first half of 2008. Using traditional RDD techniques for a statewide survey could exclude up to 20% of the target population. Wireless-only status has been increasing steadily since the NHIS began measuring this phenomenon in 2003, whereas the phoneless prevalence has remained steady. Exhibit 1 shows the rate of growth in wireless-only compared to phoneless households since 2004 (Blumberg and Luke 2008a).

Exhibit 1: Percent of Wireless-only and Phoneless Households, U.S. 2004-2008



Source: National Center for Health Statistics (Blumberg and Luke 2008a)

Exhibit 2: Percent of U.S. Adults with Various Health Characteristics, by Phone Status, NHIS, July to December 2007



Source: National Center for Health Statistics (Blumberg and Luke 2008b)

Evidence from the NHIS shows that people living in wireless-only households have different characteristics than those living in landline households. Demographically, adults in wireless-only households are more likely to be young (18-29 years), living in a rented property, living with unrelated adults, male, living in poverty, non-Hispanic, and Black. These adults also differ on key health measures. They are more likely to lack health insurance coverage, face financial barriers to care, not have a usual place for medical care, yet have better self-reported health status (Blumberg et al. 2008b). Exhibit 2 shows significant differences between wireless-only and landline households for several health and health care access characteristics.

Sample and Data Collection Issues

Traditional RDD telephone samples are drawn from eligible landline telephone numbers, but may include cell phone numbers – and by extension wireless-only households – only by accident. This has become more prominent since the advent of number portability between land lines and cell phones in late 2003. Most traditional RDD sample designs attempt to purge cell phone numbers from the sample; however, ported phone numbers may be included in an RDD sample frame.

Most state health surveys that measure health insurance coverage are conducted using traditional RDD methods and therefore do not include most people living in wireless-only households. Some state surveys, for example in California and New Jersey, have experimented with wireless-only sampling, but these efforts are not yet standard practice in the field of survey research. In addition to being more expensive to conduct, cell phone samples create problems for typical telephone surveys that have not yet been adequately addressed. Among these problems are logistical issues associated with reaching a qualified respondent, and sampling/weighting issues associated with the target population.

Logistical Issues

- The Telephone Consumer Protection Act (TCPI) prohibits use of a computer to dial cell phone numbers, thereby disallowing use of a predictive dialer (a common survey research tool that has the computer dial the number and connect an interviewer when someone picks up the telephone). Manual dialing adds to the cost of data collection.

- A large percentage of people reached by cell phone are under 18 and are not eligible to be interviewed. The Pew Research Center has found that upwards of 40% of cell phone owners are under 18 years of age (Keeter et al. 2008).
- Once a qualified respondent is reached by cell phone, the interview must use a screening process to assess if the respondent is in a safe situation to handle the call (e.g., not driving) and to determine if the person is living in a wireless-only household.
- The billing structure of cell phones in the U.S. forces the recipient to use plan minutes for the inbound call, effectively forcing the respondent to pay for the call. Researchers are concerned that this may discourage participation and have experimented with incentives (Brick et al. 2007; Link et al. 2007). Several researchers have speculated that this issue may become less significant as wireless providers offer plans with large volume of minutes and free evening/weekend calls, although there is no research to support this.
- Researchers have anecdotally expressed concern that the interview may be affected by the environment in which the call is handled. For example, would a cell phone respondent answer sensitive questions the same way at home as away from the home? Little research has been done on this mode/cognitive effect.

Sampling/Weighting Issues

- Cell phones are more likely to be attached to a single person and are generally not a shared household resource. This creates a problem for sample design and weighting; there is currently no agreed upon method to resolve this unit of measurement issue.
- There are concerns about the geographic portability of cell phone numbers, in that a cell phone number can move with a person as he/she moves to another part of the country. This can cause problems if the respondent's new location is not within the target population; for example, a person from Chicago moves to San Francisco but retains the Chicago cell phone number.
- Until recently the NHIS wireless-only estimates were restricted to a national estimate. Because of this researchers have not been able to establish a state or sub-state base population from which to apply weights.

Adjusting for the Wireless-only Population

Most state surveys do not purposively sample cell phones due to high costs and data collection complications involved. As a result, estimates of health insurance coverage may be biased by not including the wireless-only population in their sample. Researchers have advocated using additional post-stratification adjustments to these estimates based on known differences between wireless-only and landline populations as measured by the NHIS.

Post-stratification adjustments use socio-demographic control totals from the U.S. Census Bureau, such as home ownership, age, education, geography and gender, to adjust basic survey weights to account for potential non-coverage bias. Researchers have been comfortable using these techniques for non-response and minor sample non-coverage issues in the past, but the increasing prevalence of wireless-only households may make these adjustments become less effective and untenable.

Until recently the only reliable source for information on the wireless only population is provided by the NHIS, which is a nationally representative survey. The standard of adjustment is therefore based on a nationwide measure and does not account for variation in wireless-only coverage by state. State-level estimates of the wireless-only population could greatly improve the post-stratification adjustment technique for state health surveys.

Direct state-level estimates from the NHIS are not available due to the study's sample design. To overcome this design feature, researchers from SHADAC and the National Center for Health Statistics (NCHS) developed model-based state-level estimates of the wireless-only population. These estimates will greatly enhance tools for statistical adjustment to account for exclusion of this population.

The state-level wireless-only population estimates (Exhibits 3 and 4) show that there is dramatic variation across states in wireless-only coverage. For example, the prevalence of wireless-only households ranges from a low of 5.1% in Vermont to a high of 26.2% in Oklahoma. This information will help create more reliable post-stratification weights for state survey data that adjust for this potential bias and also aid in weighting of state wireless-only survey responses. These state-level wireless-only estimates can be used to help state survey analysts decide whether or not to consider including a

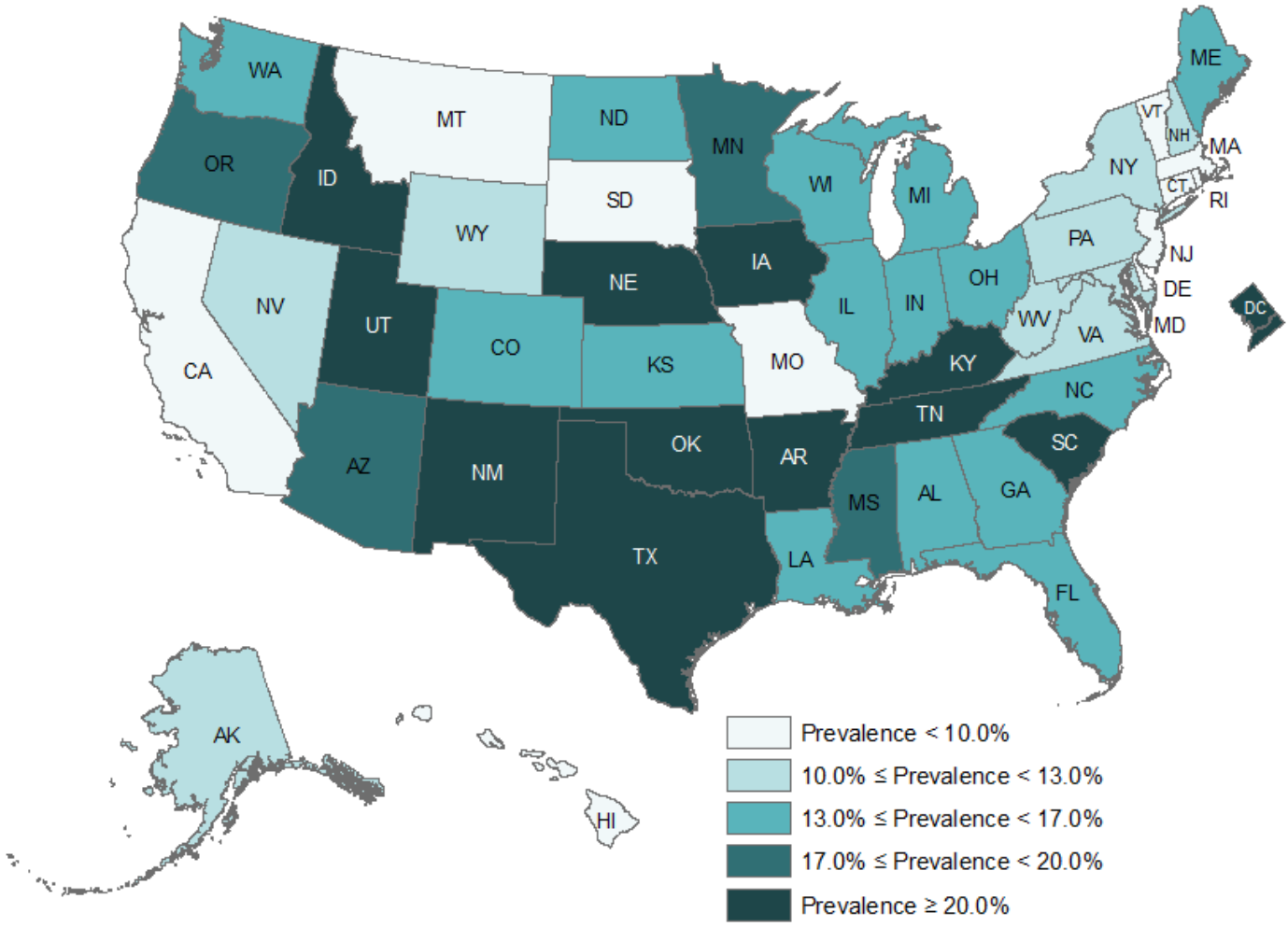
Exhibit 3: Modeled state-level estimates of the percentage of wireless-only households and the percentage of adults living in wireless-only households, 2007

	Households		Adults	
State	Percent	Widest plausible interval	Percent	Widest plausible interval
Alabama	13.9%	9.7% – 18.1%	12.2%	8.1% – 16.4%
Alaska	11.7%	8.9% – 14.8%	13.3%	7.3% – 19.5%
Arizona	18.9%	14.5% – 23.1%	17.1%	13.6% – 20.4%
Arkansas	22.6%	18.7% – 26.4%	21.2%	16.8% – 25.6%
California	9.0%	8.1% – 9.8%	8.4%	7.7% – 9.1%
Colorado	16.7%	13.2% – 20.3%	15.2%	12.5% – 18.2%
Connecticut	5.6%	3.4% – 7.8%	4.8%	2.7% – 6.9%
Delaware	5.7%	4.8% – 6.8%	4.0%	2.8% – 5.4%
District of Columbia	20.0%	15.5% – 24.5%	25.4%	15.2% – 34.1%
Florida	16.8%	13.9% – 19.4%	15.5%	12.8% – 17.8%
Georgia	16.5%	12.9% – 19.9%	15.0%	11.6% – 18.1%
Hawaii	8.0%	6.5% – 9.6%	8.2%	7.4% – 8.8%
Idaho	22.1%	18.9% – 25.3%	21.3%	19.0% – 23.9%
Illinois	16.5%	14.1% – 18.7%	15.2%	12.8% – 17.1%
Indiana	13.8%	10.3% – 16.9%	13.0%	8.9% – 16.8%
Iowa	22.2%	9.8% – 34.1%	18.9%	7.8% – 29.3%
Kansas	16.8%	12.8% – 20.6%	15.2%	11.9% – 18.1%
Kentucky	21.4%	11.7% – 30.4%	21.6%	11.5% – 30.8%
Louisiana	15.0%	10.2% – 19.6%	13.8%	9.6% – 17.9%
Maine	13.4%	10.5% – 16.5%	12.0%	10.6% – 13.9%
Maryland	10.8%	9.1% – 12.6%	9.8%	8.3% – 11.5%
Massachusetts	9.3%	7.9% – 10.7%	8.4%	7.1% – 9.8%
Michigan	16.3%	12.7% – 19.7%	15.3%	11.6% – 18.7%
Minnesota	17.4%	14.4% – 20.3%	16.5%	14.7% – 18.2%
Mississippi	19.1%	11.4% – 26.3%	20.3%	12.6% – 27.0%
Missouri	9.9%	6.8% – 12.9%	8.4%	6.2% – 10.6%
Montana	9.2%	8.0% – 10.6%	5.4%	4.5% – 6.4%
Nebraska	23.2%	13.2% – 32.7%	22.4%	12.7% – 31.2%
Nevada	10.8%	8.8% – 13.0%	10.1%	9.0% – 11.3%
New Hampshire	11.6%	9.2% – 14.3%	8.9%	7.2% – 11.0%
New Jersey	8.0%	6.0% – 10.0%	6.1%	4.8% – 7.5%
New Mexico	21.1%	11.3% – 29.6%	20.5%	10.4% – 28.8%
New York	11.4%	10.0% – 13.0%	10.6%	9.4% – 12.2%
North Carolina	16.3%	13.6% – 19.0%	14.8%	12.3% – 17.3%
North Dakota	16.9%	6.7% – 27.2%	18.1%	4.4% – 32.2%
Ohio	14.0%	11.3% – 16.6%	13.1%	11.0% – 15.3%
Oklahoma	26.2%	12.9% – 38.8%	25.1%	14.6% – 34.6%
Oregon	17.7%	14.5% – 20.8%	18.1%	15.0% – 20.8%
Pennsylvania	10.8%	8.6% – 13.0%	9.2%	7.3% – 11.2%
Rhode Island	7.9%	0.1% – 15.6%	5.3%	0.3% – 11.0%
South Carolina	20.6%	14.5% – 26.0%	19.2%	13.8% – 24.0%
South Dakota	6.4%	5.7% – 7.1%	6.8%	6.1% – 7.6%
Tennessee	20.3%	16.1% – 23.4%	20.8%	14.9% – 25.2%
Texas	20.9%	18.3% – 23.0%	19.5%	17.0% – 21.2%
Utah	25.5%	16.9% – 32.8%	23.9%	15.2% – 30.9%
Vermont	5.1%	4.9% – 5.4%	4.6%	4.5% – 4.9%
Virginia	10.8%	8.8% – 12.9%	10.0%	7.9% – 12.2%
Washington	16.3%	12.4% – 20.2%	15.6%	12.2% – 19.0%
West Virginia	11.6%	8.3% – 14.5%	10.6%	4.6% – 16.1%
Wisconsin	15.2%	11.9% – 18.4%	13.6%	10.8% – 16.3%
Wyoming	11.4%	10.8% – 12.2%	13.0%	12.3% – 14.2%

Note: Refer to Blumberg et al. (2009) for a description of the calculation of the "widest plausible interval."

Data Source: CDC/NCHS, National Health Interview Survey, 2007, and U.S. Census Bureau, Current Population Survey, Annual and Social Economic Supplement, 2008. Estimates were calculated by the State Health Access Data Assistance Center, University of Minnesota.

Exhibit 4: State-level comparisons of the percentage of wireless-only households: Modeled estimates, 2007



Source: CDC/NCHS, National Health Interview Survey, 2007, and U.S. Census Bureau, Current Population Survey, Annual and Social Economic Supplement, 2008.

cell phone sample in their study design. Information on the size of the affected population will inform the decision to include or exclude cell phone samples in telephone surveys and help estimate fielding costs if they are included. Thus, through several possible routes these state-specific wireless-only estimates will help improve the accuracy and credibility of state health survey results.

Conclusions

The increasing prevalence of the wireless-only household population poses several significant problems for researchers. Wireless-only households are typically excluded from RDD telephone surveys of health insurance coverage and access to care. Yet results from the NHIS show that these households have different characteristics from those with landline phone service, thereby raising concerns about bias to estimates that do not account for wireless-only households. Modeled estimates from the NHIS and CPS show great state-level variation in the prevalence of wireless-only households, suggesting that national estimates do not provide adequate information to state analysts. Telephone surveys are expected to continue to be a common form of data collection in the foreseeable future and states will need to rely on this survey methodology, using data adjustments to improve the accuracy of their estimates.

Because most of the state surveys do not purposively sample cell phones they can all suffer bias as a result of not accounting for the wireless-only in their sample. Researchers have advocated using post-stratification adjustments based on known differences between wireless-only and landline populations. SHADAC researchers have recently performed these adjustments for Minnesota and Oklahoma without the benefit of these state-level estimates. With this added information on the wireless-only population improvements in the post-stratification adjustment technique for state-level health surveys are expected. SHADAC is working with Colorado as they weight their 2008 household survey data collected using a dual RDD/cell phone sample frame. SHADAC will continue to report on this work as it progresses.

Suggested citation:

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